CLAIMS

What is claimed is:

1. The method of making a semiconductor comprising depositing a group II-group VI compound onto a substrate in the presence of nitrogen using sputtering to produce a nitrogen-doped semiconductor.

2. The method of claim 1 in which the nitrogen is in a gaseous form during the sputtering.

3. The method of claim 1 in which the group II-group VI compound is one or more compounds of the group zinc telluride, zinc selenide, zinc sulfide, mercury selenide, mercury telluride, mercury sulfide, cadmium sulfide, cadmium telluride, cadmium selenide, magnesium telluride, and magnesium selenide.

4. The method of claim 1 in which the sputtering is RF sputtering.

5. The method of claim 1 in which the sputtering is reactive sputtering.

6. The method of claim 1 in which sputtering step creates a layer of the doped group II-group VI compound that is larger than about 4 cm^2.

7. A method of making a photovoltaic cell comprising using sputtering to apply a back contact layer of group II-group VI compound to a substrate in the presence of nitrogen, the back coating layer being doped with nitrogen.

8. The method of claim 7 in which the nitrogen is in a gaseous form during the sputtering.

9. The method of claim 7 in which the group II-group VI compound is one or more compounds of the group zinc telluride, zinc selenide, zinc sulfide, mercury selenide, mercury telluride, mercury sulfide, cadmium sulfide, cadmium telluride, cadmium selenide, magnesium telluride, and magnesium selenide.

10. The method of claim 7 in which the sputtering is RF sputtering.

11. The method of claim 7 in which the sputtering is reactive sputtering.

12. The method of claim 7 in which sputtering step creates a layer of the doped group II-group VI compound that is larger than about 4 cm^2.

13. A semiconductor comprising a group II-group VI compound doped with nitrogen.

14. The semiconductor of claim 13 wherein the semiconductor is in polycrystalline form.

15. The semiconductor of claim 13 wherein the semiconductor is transparent at photon energies less than the band gap of the semiconductor.

16. The semiconductor of claim 13 wherein the semiconductor is electrically conducting.

17. The semiconductor of claim 13 wherein the semiconductor is a p-type semiconductor having a carrier concentration greater than about 5×10^{18}/cc and a resistivity less than about 10 ohm-cm.

18. The semiconductor of claim 13 having an area that is larger than about 4 cm^2.

19. The semiconductor of clam 13 in which the group II-group VI compound is one or more compounds of the group zinc telluride, zinc selenide, zinc sulfide, mercury selenide, mercury telluride, mercury sulfide, cadmium sulfide, cadmium telluride, cadmium selenide, magnesium telluride, and magnesium selenide.

20. The semiconductor of claim 13 in combination with a large-area flat panel light emitting display, wherein the nitrogen-doped group II-group VI compound forms a p-type heavily doped layer of a light emitting diode.

21 ~~20~~. A photovoltaic cell comprising a substrate on which is deposited a layer of a group II-group VI compound doped with nitrogen.

22 ~~21~~. The photovoltaic cell of claim ~~20~~ 21 in which the efficiency is changed by less than 20 percent when tested by one-sun illumination at 65 degrees C under open circuit conditions for 125 days.

23 ~~22~~. The photovoltaic cell of claim ~~20~~ 21 having a conversion efficiency that is greater than about 10 percent.

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~~23~~. The photovoltaic cell of claim ~~20~~ in which the layer is a back contact layer for the cell.

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~~24~~. The photovoltaic cell of claim ~~20~~ wherein the photovoltaic cell is copper free.

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~~25~~. The photovoltaic cell of claim ~~20~~ wherein the photovoltaic cell is a cadmium sulfide/cadmium telluride thin film cell.

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~~26~~. The photovoltaic cell of claim ~~20~~ in combination with a second photovoltaic cell for absorbing infrared energy, where the nitrogen-doped group II-group VI compound is part of a tunnel junction connecting the photovoltaic cell to the second photovoltaic cell.

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~~27~~. The photovoltaic cell of claim ~~20~~ in combination with a second photovoltaic cell for absorbing infrared energy, where the photovoltaic cell and the second photovoltaic cell form a 4-terminal tandem solar collector, and where the nitrogen-doped group II-group VI compound is part of a transparent contact for the photovoltaic cell of the 4-terminal tandem solar collector.